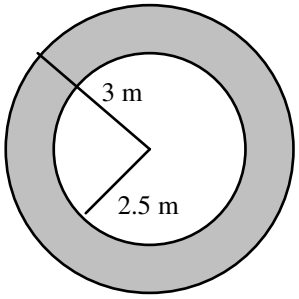
Section I – TAKE HOME TASK **DATE DUE: _____**
Total marks 60
Answer Questions on your own paper, unless supplied.

Question 1 (26 marks) Further Measurement

a) A cross-section of cement piping with a radius of 3 metres and an inner radius of 2.5 metres is shown in the diagram below.



i) Calculate the cross-sectional (shaded) area correct to 1 decimal place? **2**

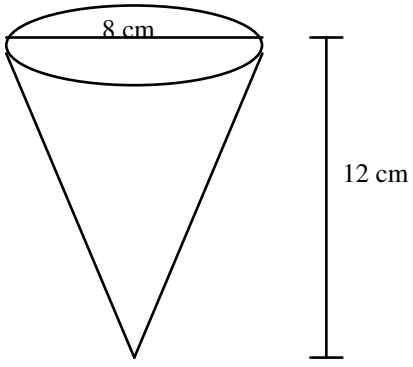
ii) The piping comes in 5 metre lengths. Calculate the volume of cement required to make one length of the pipe.

1

iii) The cement weighs 225 kg/m^3. Calculate the weight of each section of piping. Give your answer in tonnes.

1

b) The figure below is of an ice-cream cone.



i) Find the volume of the ice-cream cone correct to 1 decimal place.

2

ii) Each spherical scoop of ice-cream fits neatly into the cone. Find the volume of one scoop of ice cream correct to 1 decimal place.

2

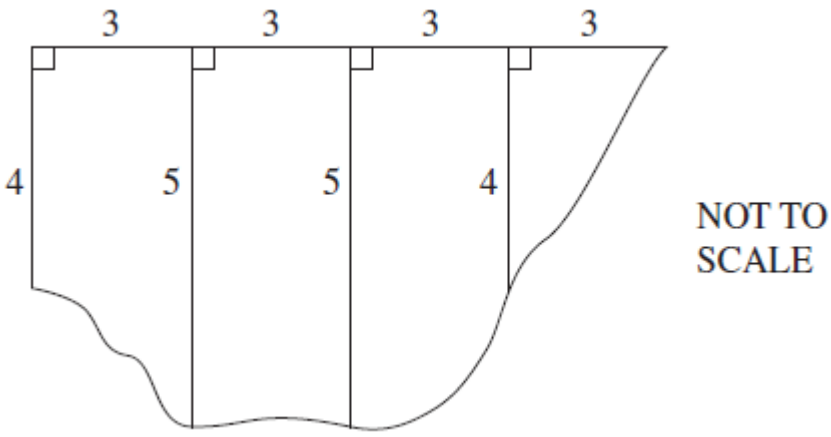
iii) Consider a **cylinder** of the same dimensions. Calculate the volume of the cylinder to 1 decimal place.

2

iv) How many times more will a cylinder hold than a cone of the same dimensions?

1

c) The figure below shows a surveyor's sketch of a headland.(measurements are in metres)



i) Use two applications of Simpson's rule to calculate the approximate area of the headland.

3

ii) The area is to be sprayed with a weed killing spray. The instructions state that 1 litre of spray will cover 7.5 m^2 of land. Calculate the amount of the weed killing spray that should be used.

1

d) The formula for the volume of a cylinder is $V = \pi r^2 h$.

i) Find the volume of a cylinder with a radius of 4.9 cm and a height of 5.2 cm, correct to 1 decimal place.

1

ii) Find the radius of a cylinder with a volume 6000 cm^3 and a height of 10 cm, correct to 1 decimal place.

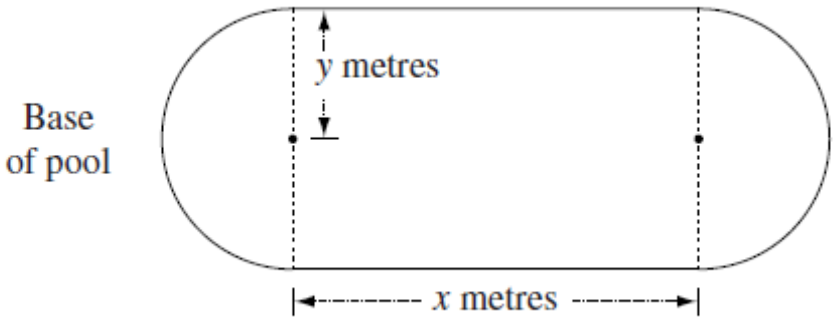
2

e) A sphere has a volume 115 m^3.

What is its radius? Answer to the nearest centimetre.

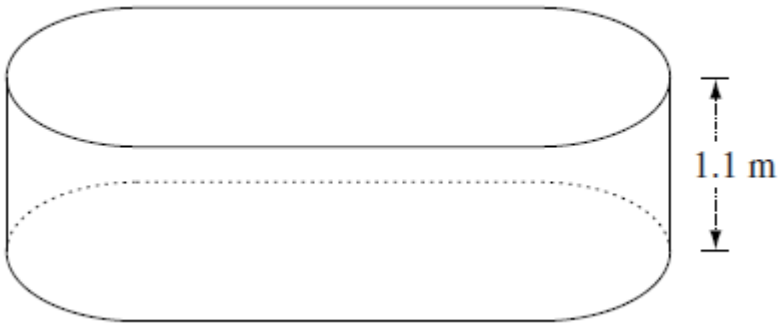
1

f) The Mitchell family has moved to a new house which has an empty swimming pool. The base of the pool is in the shape of a rectangle, with a semicircle on each end.



i) Explain why the expression for the area of the base of the pool is $2xy + \pi y^2$. **1**

ii)



The pool is 1.1 metres deep.

The sides and base of the pool are covered in tiles. If x =6 and y = 2.5, find the total area covered by tiles. (Give your answer correct to the nearest square metre.) **3**

iii) The Mitchells need to fill the pool with water. One of the children accidently fills the pool to the very top. Calculate the volume of water used, correct to the nearest m^3. **2**

iv) Convert your answer in part iii) to kL **1**

Question 2 (20 marks) Algebraic Modelling (Answer on attached sheets)

a) For the quadratic function $y = 6x - x^2$:

i) Complete the table of values given **3**

ii) Plot the graph of this equation on the attached graph paper. **3**

iii) What are the two x values when y=0. **1**

iv) Find the maximum height (ie the highest value of y). **1**

b) A ball is thrown up in the air from the balcony of Tom's apartment. Its height above ground after t seconds is given by the quadratic function $h = -5t^2 + 20t + 25$ where h is the height in metres.

i) Complete the table of values for t from 0 to 6 in the table. **3**

ii) Plot the graph for this equation. (start at t=0) **3**

iii) Find the maximum height of the ball. **1**

iv) After how many seconds does the maximum height occur? **1**

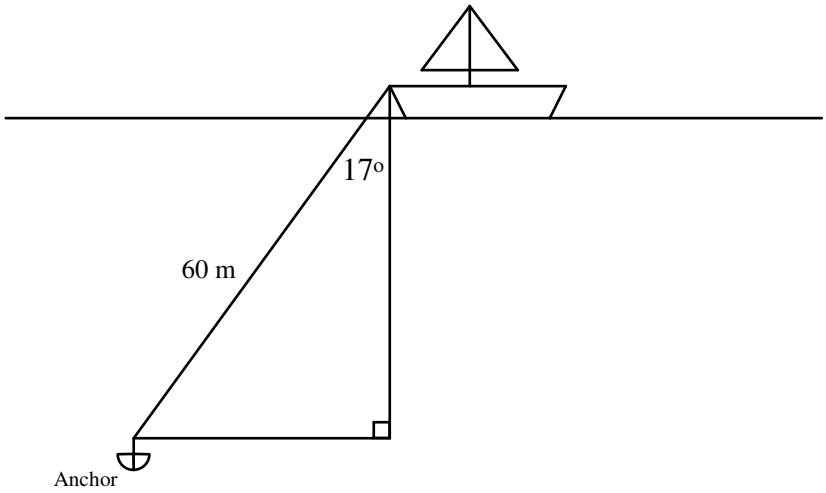
v) Calculate the height of the ball after 2.5 seconds. **1**

vi) When does the ball hit the ground? **1**

vii) Explain why you would only need the values form 0 to 5 for this equation. with this model? **2**

Question 3 (14 marks) Trigonometry

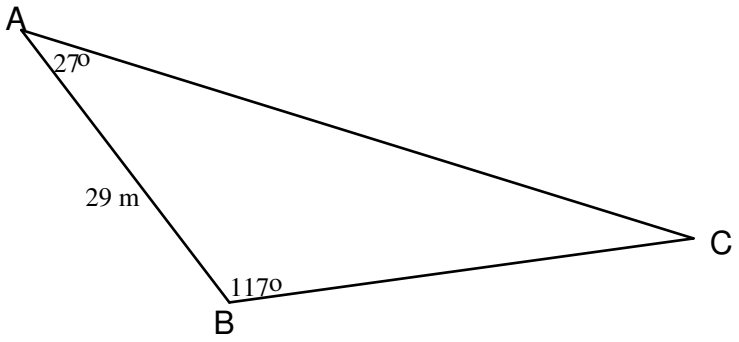
a) Sian is a boat captain who drops her anchor on 60 metres of rope vertically into the water. After an hour the rope makes an angle of 17° with the vertical as shown in the figure below.



Find the distance that the boat has drifted in metres, correct to 1 decimal place.

2

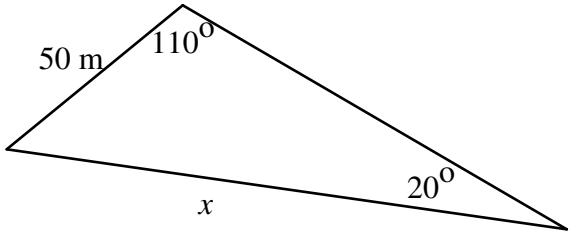
b) Consider the triangle ABC drawn below.



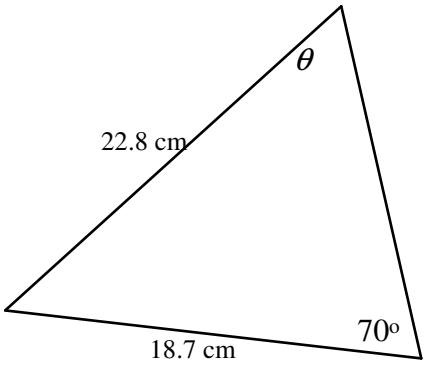
i) Use the sine rule to find the length of side AC in the triangle below. Give your answer correct to 1 decimal place **2**

ii) The area of the triangle is 289 m^2. If the side lengths of the triangle are all doubled, what will be the area of the triangle? Explain your answer. **2**

c) Find the value of the side marked x in the triangle below correct to the nearest metre. **2**



d) Find the size of the angle marked θ in the triangle below, correct to the nearest degree. **2**



e) A yacht, which is 350 metres from shore, sights the top of a lighthouse at an angle of elevation of 9°.

(i) Draw a diagram of this situation. **2**

(ii) Find the height of the top of the lighthouse above sea level correct to the nearest metre. **2**

End of Paper

Trial Examination Paper
GENERAL MATHEMATICS

FORMULAE SHEET

Area of an annulus

$A = \pi(R^2 - r^2)$
$R =$ radius of outer circle
$r =$ radius of inner circle

Area of an ellipse

$A = \pi ab$

$a =$ length of semi-major axis
$b =$ length of semi-minor axis

Area of a sector

$A = \frac{\theta}{360}\pi r^2$
$\theta =$ number of degrees in central angle

Arc length of a circle

$l = \frac{\theta}{360}2\pi r$
$\theta =$ number of degrees in central angle

Simpson's rule for area approximation

$A \approx \frac{h}{3}(d_f + 4d_m + d_l)$
$h =$ distance between successive measurements
$d_f =$ first measurement
$d_m =$ middle measurement
$d_l =$ last measurement

Surface area

Sphere $A = 4\pi r^2$
Closed cylinder $A = 2\pi rh + 2\pi r^2$
$r =$ radius
$h =$ perpendicular height

Volume

Cone $V = \frac{1}{3}\pi r^2 h$
Cylinder $V = \pi r^2 h$
Pyramid $V = \frac{1}{3}Ah$
Sphere $V = \frac{4}{3}\pi r^3$
$r =$ radius
$h =$ perpendicular height
$A =$ area of base

Sine rule

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Area of a triangle

$A = \frac{1}{2}ab\sin C$

Cosine rule

$c^2 = a^2 + b^2 - 2ab\cos C$

or

$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$

FORMULAE SHEET

Simple interest

$I = \Pr n$

P = initial quantity

r = percentage interest rate per period, expressed as a decimal

n = number of periods

Compound interest

$A = P(1+r)^n$

A = final balance

P = initial quantity

r = percentage interest rate per compounding period, expressed as a decimal

Future value (A) of an annuity

$$A = M\left[\frac{(1+r)^n - 1}{r}\right]$$

M = contribution per period, paid at the end of the period

Present value (N) of an annuity

$$N = M\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$S = V_0 - Dn$

S = salvage value of asset after n periods

V_0 = purchase price of the asset

D = amount of depreciation apportioned per period

n = number of periods

Declining balance formula for depreciation

$S = V_0(1-r)^n$

S = salvage value of asset after n periods

r = percentage interest rate per period, expressed as a decimal

Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$ = mean

x = individual score

n = number of scores

f = frequency

Formula for a z-score

$$z = \frac{x - \bar{x}}{s}$$

s = standard deviation

Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient-intercept form of a straight line

$y = mx + b$

m = gradient

$b = y$ – intercept

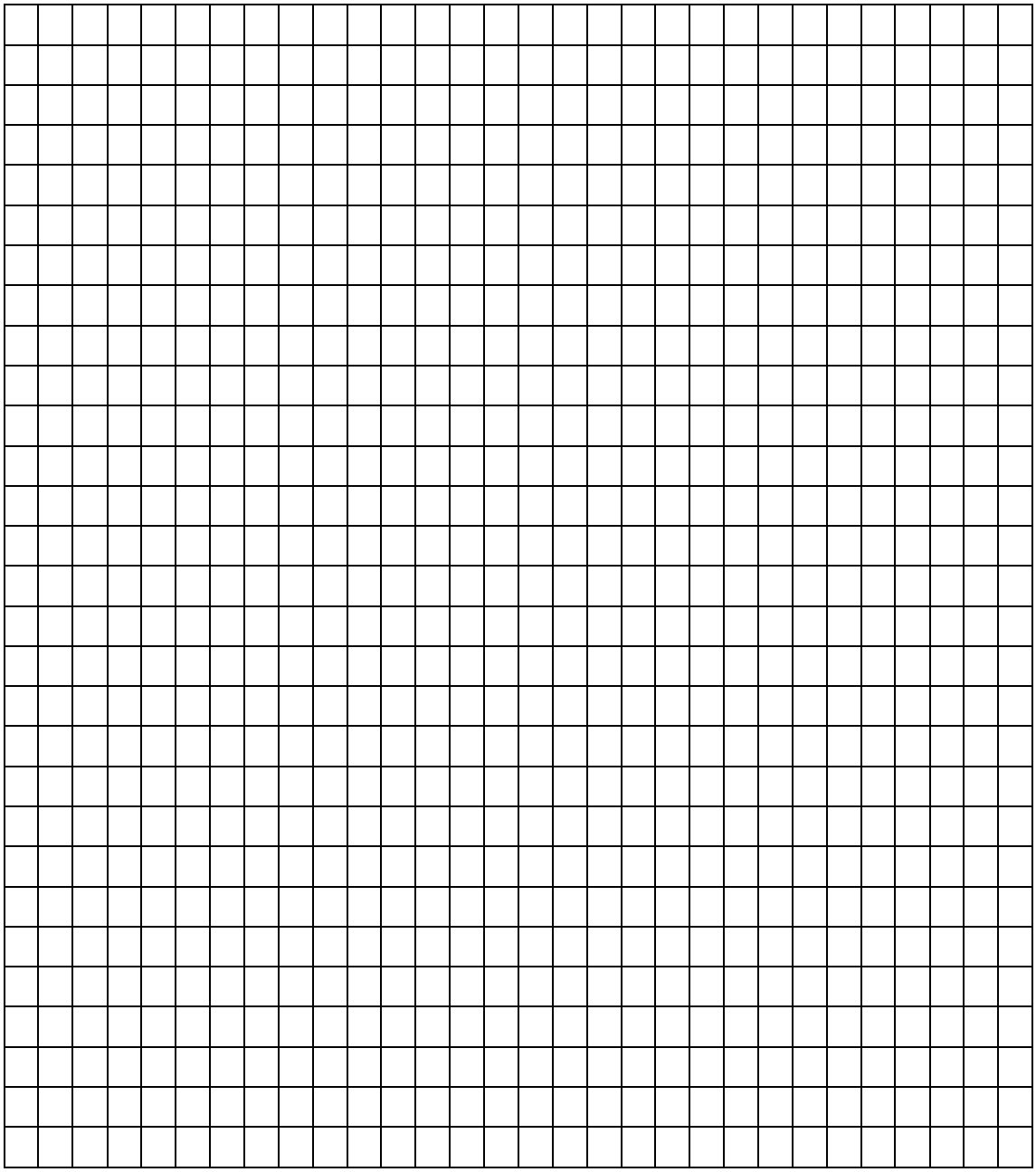
Probability of an event

The probability of an event where outcomes are equally likely is given by:

$$\text{P(event)} = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Use for Question 2 part a)

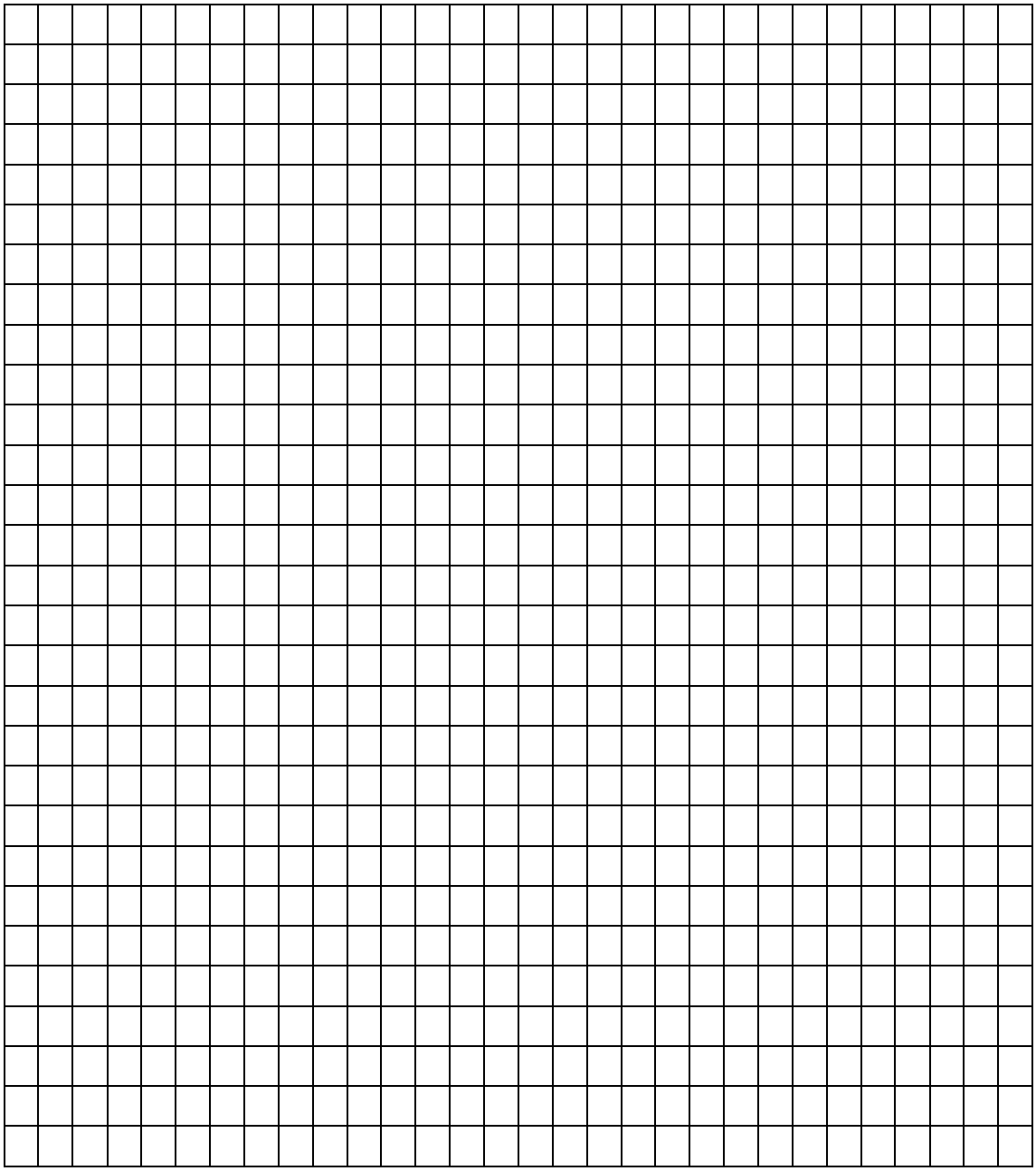
x	0	1	2	3	4	5	6
y							



iii) _____ iv) _____

Use for Question 2 part b)

t	0	1	2	3	4	5	6
h							



iii) _____ iv) _____

v) _____ vi) _____

vii) _____

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